REMARKS

Reconsideration of this application and the rejection of claims 6-8 are respectfully requested. Applicant has attempted to address every objection and ground for rejection in the Office Action dated December 1, 2011 (Paper No. 20111129) and believes the application is now in condition for allowance. In the alternative, the claims are submitted to be in better form for appeal. In this regard, the claims have been amended to more clearly describe the present invention.

Claims 6-8 are rejected under 35 U.S.C. §112, second paragraph, as being indefinite. Specifically, the Examiner states that certain of the claims include a broad range or recitation (master alloy) and a narrow range or recitation (high silicon stainless steel) that falls within that broad range. Applicant has amended the claims to overcome this rejection as shown above.

Claims 6-8 are rejected under 35 U.S.C. §103(a) as being unpatentable over the combination of Japanese Patent No. 06093388 to Hirai et al. and Japanese Patent Document No. 04063247 to Murata et al. Applicant disagrees with and traverses this rejection for the following reasons.

JP '388 discloses a high silicon stainless steel that is made by forging a steel ingot at a temperature greater than or equal to 900°C and then at a finishing temperature of

greater than or equal to 700 °C. JP '247 is cited as teaching a high silicon steel having a grain size of 15 μm or less.

In contrast, amended claim 6 recites, among other things, a process for manufacturing a silicon stainless steel which comprises the step of forging a silicon stainless steel containing Si in 3.5 to 7.0% by weight where the forging step includes "a load application step for applying one of an impact load and a static load to one of the silicon stainless steel, wherein a surface temperature of the silicon stainless steel is kept at 1,100°C or higher, and is dropped to a temperature range of 950°C or below and not so low as to break the silicon stainless steel, such that the process provides a steel material which mainly comprises a microstructure with a grain size of 15 μm or less." The cited combination fails to disclose or suggest such subject matter.

JP'388 teaches forging steel at a temperature region ≥ 900°C and finish forging at a temperature ≥ 700°C, and more specifically, heating to 1050 to 1150°C. Claim 3 of JP'388states the following: "heating the alloy intensely at a temperature region (T°C) that is 1050 to 1150°C and that satisfies the formula (2) below; then performing hot rolling or hot forging with reduction ratio or forging ratio of 2.0 or more at a temperature region ≥ 900°C and at a finish forging temperature ≥ 700°C." Thus, JP '388 clearly states that hot rolling / hot forging is performed after the alloy is intensely heated at a temperature region of 1050 to 1150°C. In contrast, the claimed process includes a load application step where the surface

temperature is at 1100°C and then dropped to a temperature of 950°C or below. JP ‘388 does not disclose such a step.

Furthermore, paragraph [0020] of JP’388 states that the alloy is intensely heated at a temperature region of 1050 to 1150°C so that the volume ratio F_p of brittle phase should be decreased and the breaking of the alloy into two parts should be prevented. Thus, the heating of the steel in JP ‘388 is not during a load application step or has any relevance to a load application step as recited in the claimed invention.

Additionally, the Examiner states that the finishing forging temperature ≥ 700°C taught by JP’388 reads on the step of dropping the temperature to 950°C or below and not so low as to break the silicon stainless steel as recited in the present claims because JP’388 further teaches to avoid crack by controlling the finish forging temperature. Applicant disagrees.

JP’388 discloses a step of “heating the alloy intensely at a temperature region that is 1,050 to 1,150°C, and then performing hot rolling or hot forging with reduction ratio or forging ratio of 2.0 or more at a temperature region ≥ 900°C.” On the contrary, the claimed invention provides a process including a step “for applying at least one of an impact load and a static load to the silicon stainless steel, wherein a surface temperature of the silicon stainless steel is kept at a temperature range from 850 to 1,050°C, and is later changed to a temperature range of 950°C or below and not so low as to break the silicon stainless

steel." Therefore, even if the temperature ranges of JP'388 and the claimed invention overlap each other, the processing method of JP'388 is completely different from that of the claimed invention.

The Examiner also states that JP'388 teaches applying the similar silicon stainless steel by the same forging operation under the similar working conditions as recited in the claimed invention and JP'388 further teaches controlling the forging temperature in re-crystallization temperature region. Therefore, the similar microstructure, for example, mainly grain size of 15 μm or less recited in the present claims would be highly expected in the forged Si stainless steel proceeded by the process of JP'388.

As stated above, the processing method of JP'388 is completely different from that of the claimed process. Furthermore, JP'388 discloses a method to re-crystallize an alloy, in which a intense heating is performed at a temperature region of 1050 to 1150°C, and then hot rolling or hot forging with reduction ratio or forging ratio of 2.0 or more at a temperature region ≥ 900°C is performed, so as to increase corrosion resistance or ductility of the alloy. However, the claimed invention obtains fine crystals by performing a step of "applying at least one of an impact load and a static load to the silicon stainless steel, wherein a surface temperature of the silicon stainless steel is kept at a temperature range from 850 to 1,050°C, and is later changed to a temperature range of 950°C or below and not so low as to

break the silicon stainless steel." Therefore, the claimed invention differs from that of JP'388 in both the processing method and the resulting metal structure.

Moreover, JP'388 processes an alloy in re-crystallization temperature region, so as to re-crystallize the alloy subsequent to the processing. However, the present invention makes the grain size of an alloy smaller by continuous forging process. Therefore, the metal structure obtained by the claimed invention is completely different from that obtained by JP'388. It is hardly possible that JP'388, in which the alloy is re-crystallized, can achieve a microstructure with a grain size of 15 μm or less as recited in amended claim 6. In fact, JP'388 does not include any description of a grain size with 15 μm or less.

Japanese Unexamined Patent Application Publication No. H04-63247 (hereinafter "JP'247") does not remedy the deficiencies of JP '388. Specifically, JP '247 discloses a process for manufacturing a high strength and high ductility stainless steel with high Si content. JP'247 also teaches to control the grain size using a hot working operation and further heat treatment to obtain fine grains of less or equal to 1 μm.

Although JP'247 discloses processing of high strength high ductility stainless steel, the content of the patent relates to a method for performing cold rolling and subsequent annealing repeatedly so as to increase the ductility of stainless steel. The steel disclosed in JP'247 is completely different from that made by hot-forging as disclosed by the claimed invention.

Also, even in plain carbon steel, if it is processed by repeated cold rolling and subsequent annealing, its ductility is substantially increased, and therefore the plain carbon steel processed as such can be used for exterior body panels of cars or cans of canned goods, etc., which should be made by deep drawing. However, plain carbon steel processed by hot rolling is not suitable for such deep drawing because of its low processability. Likewise, in high silicone stainless steel, cold-rolled steel and hot-rolled steel are completely different. JP 62124218, which is cited by JP'247 as a prior art document, includes an example of cold-rolled high silicone stainless steel that contains 4.1 wt% Si and shows elongation of 17%. Even in high silicone stainless steel, this level of elongation can be obtained if the steel is processed by cold rolling and subsequent annealing.

As described in JP'247, the steel processed by cold rolling and subsequent annealing is first transformed to a martensite single-phase structure by cold rolling with high rolling reduction, and then is transformed to an austenite single-phase structure or a two-phase structure composed of an austenite phase and a martensite phase by applying repeated annealing, by which the steel acquires high strength and high ductility.

In contrast, the forging performed in the claimed invention involves hitting metal with a hammer while heating it and applying pressure to the metal, so that the spaces inside the metal are broken, and crystals of the metal are refined and oriented to a certain direction, whereby the strength of the metal is increased as well as the metal is formed into a

desired shape. Therefore, the steel disclosed in the claimed invention has a completely different metal structure compared to that of the steel in JP'247.

Therefore, the examiner's assertion that "applying the hot working operation and further heat treatment as demonstrated by JP'247 in the process of JP'388 allows a person skilled in the art to obtain an alloy having the property provided by the present invention" signifies applying heat treatment that is different from the treatment used by the claimed invention to materials that are different from those provided by the claimed invention. Thus, the examiner's statements concerning claims 7 and 8 in connection with JP'388 and JP'247 also have no relevance to the claimed invention.

Plain carbon steel and special steel including silicon stainless steel take on completely different characteristics depending on the combination of components, processing temperatures, and methods of processing. Therefore, combining a specific temperature and a specific method of processing does not necessarily produce steel having the same characteristics.

For all of the above reasons, Applicants submit that amended claims 6 and 7, and claim 8 which depends from claim 7, are each patentably distinguished over the cited combination and in condition for allowance.

Applicant submits that in view of the above-identified amendments and remarks, the claims in their present form are patentably distinct over the art of record. Allowance of the rejected claims is respectfully requested. Alternatively, the claims are submitted to be in better form for appeal. Should the Examiner discover there are remaining issues which may be resolved by a telephone interview, the Examiner is invited to contact Applicant's undersigned attorney at the telephone number listed below.

Respectfully submitted,

GREER, BURNS & CRAIN, LTD.

By /Christopher S. Hermanson/
Christopher S. Hermanson
Registration No. 48,244

February 22, 2012

300 S. Wacker Drive – Suite 2500
Chicago, Illinois 60606-6501
Telephone: (312) 360-0080
Facsimile: (312) 360-9315
Customer No. 24978